

Venus cloud-aerosol observation using Life-signature Detection Microscope (Venus LDM)

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Much of the size and shape information about of Venus aerosols forming the haze and the cloud layer is obtained from indirect inferences from analysis of variation of polarization with phase angle and the glory feature from Venus images, together from nephelometers and particle spectrometers on descent probes. The particles are inferred to be spherical and it desirable to obtain the size/shape information about the particles, particularly the large particles ($> 3 \mu\text{m}$) whose shape is uncertain.

Microscopic imaging of Venus aerosols can be an attractive measure for the *in situ* particle characterization of Venus' cloud layer. Direct measurements with a fluorescence microscope can provide information on the biochemical characteristics, as well as morphology, density of the particles.

Recently, a fluorescence microscope system for life-signature detection on Mars surface (Mars LDM) has been designed and under development. Application of this system is promising to observe Venus cloud particles, upon overcoming several challenges including strong acidity and the corrosive effects of the sulfuric acid (~75%) of the aerosol.

Various aerial platforms for long duration sampling of the Venus clouds have been proposed or considered, and further technical development is needed. In addition, an aerosol collection system is needed for microscopic imaging. In this context, a fluorescence imaging approach is proposed in combination with a collector based on impactors for the Venus clouds. For the preparation of the system, we identify the following main challenges:

- (1) What kind of microorganisms can be used as models for the instrument performance evaluation?
- (2) What fluorescent stains can be used in the strong acidic condition?
- (3) How can we interpret the fluorescence microscope images of the particles?

Discussions on these questions and proposal for approaches will be performed for an *in situ* bio/chemical and physical characterization system for Venus cloud particles based on fluorescence microscopy. We also identify the challenges and describe our approach to overcoming them for a fluorescence microscope based on an *in situ* bio/chemical and physical characterization instrument for use in the Venus clouds, using suitable aerial platform.

Keywords: life signature detection microscope, Venus cloud